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THE DIFFERENTIAL EFFECTIVENESS OF HIGH SCHOOLS WITH SELECTED CHARACTERISTICS IN PRODUCING COGNITIVE GROWTH IN DIFFERENT KINDS OF STUDENTS.

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EVIDENCE IS PRESENTED ABOUT THE RELATIONSHIP OF INDEPENDENT STUDENT AND SCHOOL VARIABLES TO DEPENDENT VARIABLES. THE EVIDENCE IS DERIVED FROM THESE SOURCES--(1) PUBLISHED AND UNPUBLISHED DATA FROM PROJECT TALENT, (2) EQUALITY OF EDUCATIONAL OPPORTUNITY BY COLEMAN, ET. AL., (3) A SPECIAL ANALYSIS OF UNPUBLISHED DATA GATHERED BY PROJECT TALENT. THE DIFFERENTIAL ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS ON LITERATURE INFORMATION TESTS, SOCIAL SCIENCE, AND MATHEMATICS APPEARS TO BE RELATED VERY LITTLE TO ANY MEASURED CHARACTERISTICS OF THE SCHOOLS THEY ATTEND. ACHIEVEMENT MAY BE RELATED TO FAMILY BACKGROUNDS, BUT THOSE RELATIONSHIPS ARE NOT HIGH. LITTLE DIFFERENCE EXISTS BETWEEN SCHOOLS IN THEIR ABILITY TO AFFECT THE RELATIONSHIP BETWEEN PREDISPOSING CHARACTERISTICS AND THE COGNITIVE GROWTH OF STUDENTS. HOWEVER, IT SHOULD NOT BE INFERRED THAT SCHOOL FACTORS MAKE NO DIFFERENCE FOR ACHIEVEMENT OR GROWTH. UNTIL RESEARCH IS CARRIED OUT ON THE DIFFERENTIAL RESPONSES OF DIFFERENT KINDS OF STUDENTS TO DIFFERENT KINDS OF TEACHER-STUDENT TRANSACTIONS, INTERPRETATIONS OF THE RESULTS OF STUDIES SUCH AS THOSE OF COLEMAN AND PROJECT TALENT WILL REMAIN DIFFICULT. (AUTHOR)

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HARRY C. BREDEMEIER

JUNE, 1967

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CONTENTS

SECTION	PAGE
Acknowledgements	iii
Introduction and Method	1
Results	3
Discussion	41
Implications for Research	50
Summary	71
References	73

FACTORS AFFECTING THE ACHIEVEMENT OF PUBLIC SCHOOL STUDENTS

Harry C. Bredemeier

Among the functions of public schools is the function of improving their students' knowledge and intellectual understanding. Two major categories of independent variables that might affect the performance of that function may be distinguished: Characteristics of the schools, and characteristics of the students themselves. More often than not, these are investigated separately; but it seems reasonable to suppose that they interact perhaps in complex ways, to affect student learning.

Among the student characteristics that might theoretically be expected to affect educational outcomes are the following on which evidence will be reviewed: (1) The degree of mastery of intellectual skills which students bring to the schools; (2) the goals of students, for which formal school experiences may (appear to) be more or less relevant; (3) the degree to which students embrace or display distance from[/1] the student role; (4) the degree to which non-school environments of the students, especially their familial environments, reinforce or are congruent with the presses[/2] and the opportunity structures[/3] of the school environment; and (5) various aspects of the students' general personality systems.

Among the school characteristics that need to be investigated as independent variables and on which evidence will be reviewed below are the following: (1) Qualities of teachers; (2) non-teacher aspects of the school system; (3) the context comprised of the student body; and (4) community economic investments in schools.

The body of this paper consists of evidence concerning the relation of those student and school independent variables to the three kinds of dependent variables described above. The evidence comes from four sources: (1) Published and unpublished data from Project TALENT, a study of nearly half a million students in 1353 high schools undertaken for the United States Office of Education by the University of Pittsburgh in 1960, under the direction of John C. Flanagan (hereafter referred to as TALENT);[4] (2) James S. Coleman, et al, Equality of Educational Opportunity,[5] a study of 469 high schools, 959 feeder schools, and over 600,000 students made in 1965-66 (hereafter referred to as "Coleman"); (3) a special analysis of unpublished data gathered by Project TALENT in a re-study in 1963 of some 7500 high school seniors who had been previously studied in 1960 when they were Freshmen (hereafter referred to as "Growth Study").[6]

ACHIEVEMENT SCORES

The Coleman study administered tests of verbal ability, non-verbal ability, reading comprehension, mathematics achievement, and "general information" in the areas of practical arts (separately for boys and girls), natural sciences, social studies, and humanities.

Analyses of the relationship among test scores and between test scores and other variables showed that the verbal ability score was the most sensitive to presumedly significant variation in school characteristics. Coleman's analysis, therefore, is based on those scores as the dependent variable. Project TALENT administered achievement tests in 49 different subject areas, ranging from reading comprehension and creativity, through mathematics information, to speed in clerical checking. Of these, the scores on the English achievement test (Project TALENT's designation is test R-230) will be used as the dependent variable in the following analysis, on the assumption that they may be presumed to be comparable to Coleman's verbal ability scores.

School Systems and Achievement

Twenty-seven of the secondary schools investigated by Project TALENT served students in low income areas of large cities (one and a half million or more), and 55 of them served middle or upper income students in cities of the same size. It is those public schools on which we shall focus first. Table 1 shows the correlations between the school characteristics listed and scores on an English achievement test for twelfth grade boys and girls combined.

Table 1. Correlations between Selected School Characteristics and English Achievement Test Scores for Twelfth Grade Boys and Girls in Two Types of Large City High Schools.

School Characteristics	Schools Serving Middle Income Students[7]	Schools Serving Low Income Students[7]
Class Size in Science and Mathematics	-.032	.322
Class size, other	-.314	.546
Senior class size	.216	.712
Provision of Study Halls	.304	-.478
No. books in library	.397	-.117
Per pupil expenditure	.065	.456
Starting salary-female	.186	-.134
Starting salary-male	.363	-.134

SOURCE: Computer Print-Out Matrix I-A, kindly loaned by the Project TALENT Data Bank to the author.

The relationships shown are in some cases surprising. For middle income students, the conventional wisdom concerning which school factors "make a difference" is upheld: They score higher, the lower the class size, the more study halls are provided, the more books in the library, and the higher are teachers' starting salaries. But among lower income students, the conventional wisdom seems to be inapplicable. Such students score higher the larger the class size, the less the provision of study halls, the fewer the books in the library, and the lower the starting salaries of teachers. Moreover, general per pupil expenditures do not seem to make much difference for middle income students, but they make a fairly sizeable difference for low income students.

Coleman's findings also run counter to the conventional wisdom, although they differ in detail. He does not report correlations, but focuses on the percentage contribution to the variance of verbal ability scores made by various factors. The "curriculum facilities" measure employed by Coleman included the number of books in the school library per student, science laboratory facilities, number of extra-curricular activities, presence of an accelerated curriculum, comprehensiveness of the curriculum, the use of grouping or tracking, movement between tracks, number of guidance counselors, school size, and the urbanism of the school's location.

Coleman's findings are shown in Table 2.

Table 2. Unique percentage contributions to variance in verbal achievement by individual facilities and curricular measures, with six background factors[8] controlled and with all of the facilities and curricular measures controlled but the one listed.

	Grade 12		Grade 9	
	Whites	Negroes	Whites	Negroes
Expenditures	.54	.54	.87	.87
Volumes	(-).12	.05	.03	0
Laboratories	.20	.42	(-).05	.07
Extracurricular	.93	.10	.02	.01
Accelerated	.33	.11	0	.04
Comprehensiveness	(-).02	0	(-).13	(-).01
Grouping or tracking	0	(-).19	0	(-).01
Movement between tracks	0	(-).19	0	(-).88
Size	(-).19	.16	.04	.09
Guidance	.81	.06	.17	.06
Urbanism	.28	.11	0	.15

SOURCE: Coleman, Table 3.24.2, p. 314

Coleman's conclusion from these findings is that "Differences in school facilities and curriculum...are so little related to differences in achievement levels of students that, with few exceptions, their effects fail to appear even in a survey of this magnitude." (p.316) Among the "few exceptions," the most notable are that the number of scientific laboratories and the number of extra-curricular activities have a consistent (but small) relationship to achievement; and that school curriculum and activities make less difference for all whites and for Northern whites and Negroes than for all Negroes and for Southern whites and Negroes. (p. 313. The data by region are not shown in Table 2.)

From both Coleman and Project TALENT we may conclude that most of the school characteristics conventionally thought to affect students' achievement do not in fact by themselves or in combination with one another do so; and that where they are important, they are most important for disadvantaged youth -- but sometimes in inverse direction.

Teacher Quality and Achievement

Teachers, however, make a difference, again mostly for the disadvantaged. The Project TALENT data for large city schools show a correlation of .158 between achievement and the experience of teachers, among middle income students, but a correlation of .547 between those variables for low income students.[/9]

Coleman's findings are summarized in Table 3.

Achievement and the Context Provided By Other Students

The Project TALENT data do not permit analysis of the effects on student achievement of the composition of the student body in which a given student finds himself. It is one of Coleman's potentially most

Table 3. Cumulative variance in achievement explained for Negroes and whites at grade 12 by adding the school average of specified teacher variables in the order listed.

Teacher Variables	Cumulative percent of variance explained	
	Negroes	Whites
1. Average educational level of teachers' mothers	2.26	0.10
2. Average years experience in teaching	3.37	0.12
3. Whether teachers had lived mostly in area	3.38	0.47
4. Average level of education of teachers	4.87	1.08
5. Average score on vocabulary test	7.05	1.21
6. Teachers' preference for teaching middle class white collar students	8.09	2.07

SOURCE: Coleman, op. cit., Table 3.25.2. The listed characteristics of teachers make very little difference at all for white students; but they make four times as much difference (which still is not much) for Negro students.

sensational findings, however, that this is a more important variable than all of the school facilities and curricula, and more important than teacher quality.

The student body characteristics Coleman examined are the proportion whose families own encyclopedias, the number of student transfers (an index of mobility), attendance rates, the proportion planning to attend college, and the average hours of homework engaged in.

His analysis is developed in several tables which cannot be summarized here; but his emphatic conclusion is that "Attributes of other students account for far more variation in the achievement of minority group children than do any attributes of school facilities and slightly more than do attributes of staff." (p. 302) The better the familial and educational backgrounds of the majority of students, and the higher the level of their aspirations, the higher the achievement of students, but especially that of minority group students.

Personality and Achievement

Project TALENT administered several personality tests to the high school students in its sample, and correlated scores on them with scores on the intellectual tests. For reasons that will be explained below, only five of these personality measures will be discussed here -- namely, what TALENT called Impulsiveness (indexed by 9 such items as "I like to do things on the spur of the moment," "I am cautious"); Calmness (9 such items as "I often lose my temper," "I am usually self-controlled "); Leadership (5 such items as "People naturally follow my lead," "I am influential"); Mature Personality (24 such items as "I work fast and get a lot done;" "It bothers me to leave a task half-done"); and Self-Confidence (12 such items as "I am often worried;" "I am confident").

For reasons that will also be explained below, we show in Tables 4 and 5 the correlations of those scores with three achievement tests (Literature, Social Studies, and Mathematics), and with two tests that might be regarded as "aptitude" tests (Reading Comprehension and Abstract Reasoning Ability), for ninth graders and (Table 5) for twelfth graders.

For good measure the inter-correlations of the personality measures are also shown.

Out of the 40 correlation coefficients of relevance to this section (five personality scales with each of two achievement tests in two different grades for each sex), all are positive, all but five are statistically significant; but the highest one is .279 (between "Mature Personality" and Social Studies for ninth grade girls); only nine are .200 or above; and six are less than .100.Personality factors do have some relationship to achievement, then, but they account for only an extremely small proportion of the variation in achievement scores -- at the most, 8 percent.

Much more important are the "aptitudes" of reading comprehension and abstract reasoning ability. For both sexes at both grades, reading comprehension correlates between .699 and .768 with both social studies and literature achievement; and abstract reasoning ability correlates between .419 and .506 with the two achievement tests.

Table 4. Correlations of Personality Test Scores With Selected Achievement and Aptitude Test Scores Among Ninth Graders, by Sex.

	Literature	Social Studies	Reading Comprehen	Abstract Reasoning	Impulsiveness	Calmness	Leadership	Self-Confidence	Mature Personality
	1	2	3	4	5	6	7	8	9
1. Literature		.731	.701	.454	.010	.194	.082	.224	171
2. Social Studies	.587		.764	.506	.001	.246	.089	.258	243
3. Reading Comprehension	.686	.731		.541	016	.242	.079	.257	.254
4. Abstract Reasoning	.477	.499	.598		.079	.130	.007	.126	123
5. Impulsiveness	.109	.101	.100	.028		.271	.316	.135	292
6. Calmness	.210	.233	.246	.169	.168		.404	.433	625
7. Leadership	.117	.127	.114	.061	.290	.402		.252	.498
8. Self-Confidence	.170	.164	.194	.115	.157	.430	.320		.412
9. Mature Personality	.260	.279	.277	.162	.236	.620	.492	.392	

SOURCE: Flanagan, *et al*, Tables 2-7a and 2-7b, pp. 2-22 and 2-224. Correlations for boys are shown *above* the diagonal line; those for girls, *below* it.

Table 5. Correlations of Personality Test Scores With Selected Achievement and Aptitude Test Scores Among Twelfth Graders, by Sex .

	Literature 1	Social Studies 2	Reading Comprehension 3	Abstract Reasoning 4	Impulsiveness 5	Calmness 6	Leadership 7	Self-Confidence 8	Mature Personality 9
1. Literature		.734	.702	.419	.092	.197	.148	.196	.171
2. Social Studies	.722		.699	.438	.066	.170	.119	.168	.159
3. Reading Comprehension	.704	.716		.555	.077	.162	.102	.189	.173
4. Abstract Reasoning	.442	.468	.573		-.001	.118	.075	.094	.109
5. Impulsiveness	.158	.133	.132	.058		.147	.260	.136	.198
6. Calmness	.144	.156	.140	.111	.056		.360	.435	.588
7. Leadership	.131	.139	.105	.105	.206	.364		.315	.485
8. Self-Confidence	.131	.131	.115	.092	.129	.408	.384		.409
9. Mature Personality	.185	.218	.193	.152	.096	.562	.480	.392	

SOURCE: See note to Table 4.

Coleman did not develop similar kinds of personality scales; but he did develop two indices that reflect certain aspects of personality functioning. One is an index of "Self-Confidence of Ability" ("How bright do you think you are in comparison with the other students in your grade?" "I sometimes feel that I just can't learn." "I would do better in school work if teacher didn't go so fast."). The second is an index of "Sense of Control Over the Environment" ("Good luck is more important than hard work for success;" "Every time I try to get ahead someone or something stops me;" "People like me don't have much of a chance to be successful in life").

Coleman says about these two scores, in general, that "Taken alone, these attitudinal variables account for more of the variation in achievement than any other set of variables (all family background variables together, or all school variables together). When added to any other set of variables, they increase the accounted for variation more than does any other set of variables." (p. 319)

He goes on, however, to express his suspicion about the self-concept variable. As he puts it, "The relation of self-concept to achievement is, from one perspective, merely the accuracy of his estimate of his scholastic skills, and is probably more a consequence than a cause of scholastic achievement." But then he goes one step further and points out a particularly interesting fact. "At grade 12, for whites and Oriental-Americans, "self-

concept" is more highly related to verbal skills....than is [the control-of-environment variable]; for all the other minority groups, the relative importance is reversed: the child's sense of control of environment is most strongly related to achievement." He then suggests that there may be "....a different set of predispositional factors operating to create high or low achievement for children from disadvantaged groups than for children for advantaged groups. For children from advantaged groups, achievement or lack of it appears closely related to their *self*-concept: what they believe about *themselves*. For children from disadvantaged groups, achievement or lack of achievement appears closely related to what they believe about their *environment*: whether they believe the environment will respond to reasonable effort, or whether they believe it is, instead, merely random or immovable." (320-321)[10]

At the ninth grade, both attitude scores together account for about 20% of the variance of Negro achievement scores and about 31% of that of whites'. At the 12th grade, the respective figures are 16% and 28%. (Coleman, Table 3.26.1, p. 321) The unique contributions to the accounted for variance made by each attitude at the ninth and twelfth grades for Negroes and whites are shown in Table 6.

It is clear that, although Coleman found these attitudes to be more important than most other variables, their importance is still not very great. Moreover, comment needs to be made on Coleman's suggestion that the Self-Concept variable may reflect, as much as cause, achievement; and his related suggestion that this is not so self-evidently probable in the case of Sense of Control of the Environment. In the first place, his findings show that very little of the variation of those attitudes is accounted for by differences in the students' family backgrounds, which is the major place Coleman looked for them. (p. 324) In the second place, it seems reasonable to suppose that experiences children have in school could contribute to their sense of control over the environment. Two available pieces of evidence on this possibility lend some support to it. One is Coleman's report that, for minority status children, "School integration... /may/ increase their sense of control of the environment," (p. 324) which is to suggest that that sense of control is a dependent variable, influenced by certain aspects of the school itself.

Table 6. Unique contribution to accounted-for variance of verbal skills made by two attitudes, for Negroes and whites at grades 9 and 12.

	Unique Contribution			
	Grade 9		Grade 12	
	Negro	White	Negro	White
Self-Concept of Ability	1.16	3.49	2.91	5.82
Sense of Control of Environment	8.89	3.88		

SOURCE: Coleman, Table 3.26.2, pp. 322-323

The other piece of evidence comes from some research at the Rutgers Urban Studies Center, as yet unpublished. Low income Negro students in the 6th, 8th, 10th, and 12th grades were given, among other things, Srole's anomia scale. Their *rates of improvement* (note: not ability at a point in time) in reading skills between their *third and sixth grades* (note: *before* the administration of the anomia scale) were found to be inversely related to the anomia scores. That is to say, if the anomia scale can be regarded as a measure of sense of control of the environment, as its items would suggest, there is suggestive evidence that *experiences of success in school* might be as much a source of a sense of control over the environment as a result of it.

Very likely, as Coleman also notes, there is a beneficent circle involved; but it seems important (as we will elaborate later) to recognize that *schools* can provide the *initiation* of the circle, as well as benefit from it.

Family Backgrounds and Achievement

Coleman's findings concerning the influence of family background characteristics on verbal ability are summarized in Table 7.

Table 7. Percent of variance in verbal achievement accounted for at grades 9 and 12 by six objective family characteristics,[11] by two subjective family characteristics,[12] and by all eight.

	Grade 9			Grade 12		
	Objective	Subjective	Both	Objective	Subjective	Both
Negroes	12.15	2.84	14.99	13.48	1.66	15.1
Whites	17.81	5.47	23.28	14.71	8.32	23.0

SOURCE: Adapted from Coleman, Table 3.221.3, p. 300.

Between 15% and 23% of the total variance is accounted for by family background characteristics. This compares to a range of 10-21% of the total variance that is accounted for by school-to-school differences (but it must be remembered that part of the school-to-school differences are themselves differences in family background. In fact, between 21 and 29 percent of the between-school-variation is accounted for by variations in family background).[/13]

Family backgrounds, it appears, are noticeably more closely related than school characteristics to verbal achievement; and the relationship is greater among whites than among Negroes--which, of course, is another way of saying what was observed earlier, that school factors are more closely related to the achievement of disadvantaged youth than of advantaged. It is worth noting also that at grade 12 nearly all of the differences between whites and Negroes in this context lies in the closer relationship of "subjective" family factors to achievement among Negroes. It is not so much the objective facts of "disadvantagedness" that inhibit school achievement, as the attitudes and expectations impinging on the child (which attitudes may, of course, be correlated with objective disadvantages).

But it also deserves to be emphasized here (we shall return to this point later) that, although family factors are more closely related to achievement than school factors, they are not very closely related. Most of the variance is still unaccounted for. (For future reference we may note that a factor that accounts for between 15 and 23 percent of the variance of achievement is correlated with achievement about .387-.479.)

GROWTH IN ACHIEVEMENT

When we attempt to account for differences in student manifestations of verbal ability by looking at school characteristics, at students' personalities, or at family backgrounds, we do not get very far. We note that certain school characteristics are more closely related to achievement scores among Negroes than among whites, and that some of the relationships are opposite in sign for the two races.

It may be argued, however, that to measure the relationship between the scores of a school's students and various characteristics of the school at a single point in time is not at all to measure the impact or effectiveness of the school. For a school whose students score lower than those of another school may nonetheless have been doing a more effective job of education, in the sense that the former school may have caused more growth to occur in its students than the latter. And, this argument continues, it is the production of change in its students' abilities that is the function of the schools.

Coleman pays attention to this point in the following way: It might be argued, he writes, that "School effects were not evident because no measurement of educational growth was carried out. Had it been, then some schools might have shown much greater growth rates of students than would others and these rates might have been highly correlated with school characteristics.

"If this were the case, then one of the strongest implications would be that the correlation between family background and achievement should show a decrease over the years of school roughly proportioned to the school effect, and correspondingly, school factors should show an increase in correlation with achievement. Only if family background were homogeneous within schools, and if the school's effect were highly correlated with family background, would a school effect maintain a high correlation of achievement to family background. But it has already been shown that schools appear to have an effect that is dependent upon the average family background in the school -- an effect through the student body not through the characteristics of the school itself. Thus, the question posed above can only be meaningful if it refers to an effect independent of the student body composition. And such an effect, as indicated above, would reduce the correlation between family background factors and achievement, and increase the relation of school factors with achievement. Yet there is little increase in the variance in achievement explained by school characteristics, though there is some increase in variance explained by teacher characteristics, and more increase in variance explained by student body characteristics." (p. 311)

Coleman's reasoning is persuasive; but in the first place some of its implications remain to be verified, and in the second place there remain the two questions of what does account for growth, and of whether different kinds of schools might contribute differentially to different rates of growth by different kinds of students along different kinds of dimensions. For these reasons the present author took advantage of Project TALENT's re-examination in 1963 of some 7500 students who had been tested in 1960.[/14] (See note 7)

In the Growth Study scores made as ninth graders in 1960 by 1802 boys and 1937 girls on tests of literature and social studies were subtracted from the scores they made as twelfth graders in 1963. In addition, scores made as ninth graders in 1960 by 1703 boys and 1813 girls on tests of mathematics were subtracted from their twelfth grade scores. The differences were regarded as Growth Scores.

A growth score of this type has a serious limitation in that the higher students scored in the 9th grade, the less they could grow (in terms of the same test) during the next three years. It had been part of the plan of investigation, after preliminary analysis of growth scores constructed in this way, to do a parallel analysis using a different kind of growth score. The second kind was to have been constructed by dividing the difference between a ninth grade score and a perfect score into the differences between the ninth and twelfth grade scores. The quotient would be the percent of possible improvement that was actually made.

This plan went awry, however, when the Project TALENT data bank unexpectedly began to move from Pittsburgh to Palo Alto, California, in the Spring of 1967, a move which required the erasing of the tapes on which the data for the present study were stored; and a delay until the Fall of 1967 before new tapes could be prepared for the different computer in Palo Alto. Further analysis will be attempted in the future; but for the present, the imperfect growth score described above is the basis of this analysis.

Teacher Quality and Growth

An "index of teacher quality" (TQ) was constructed as the simple sum of the points assigned for the following characteristics.[15]

GSC Items	Responses	Points
Percent of teachers with BA only	Less than 50%	2
	50-75%	1
Percent of teachers fully certified	All	1
Percent of teachers spending at least half time teaching in area of major preparation	All	1

GSC Items	Responses	Points
Percent of teachers with graduate training in areas taught	75% or more	3
	50-74.99%	2
	.25-49.99%	1
Percent of teachers attending Summer School last year	50% or more	3
	25-49.99%	2
	10-24.99%	1
Areas in which one or more teachers attended NSF or other Summer Institutes	Code 7 (all 3)	3
	Codes 4,5,or 6	2
	Codes 1,2,or3	1
Annual Starting Salary - Male	$4000 or more	3
	3500-3999	2
	3400-3499	1
Average number years experience of staff	15 or more	4
	12-14	3
	9-11	2
	6-8	1
Minimum to Maximum Score		0-20

Each student was then assigned the score of his school on the TQ index, and correlation coefficients were calculated (separately for each sex) between those scores and students' growth scores in Literature, Social Studies, and Mathematics.

The results are shown in the first row of Table 8.

Table 8. Correlation between student growth scores and the quality of schools attended.

	Literature		Social Studies		Mathematics	
	Males	Females	Males	Females	Males	Females
Teacher Quality	.01	-.01	-.10	-.07	.01	.00
Academic Investments	-.07	-.02	-.14	-.01	-.01	.00

There is no relationship between teacher quality as measured and student growth for either sex on any measured dimension.

Academic Investments and Growth

A similar index of non-teacher-related academic characteristics of the schools was calculated as the sum of the points shown below for the indicated characteristics.

GSC Items	Responses	Points
Average class size - science or math	17 or less	3
	18-23	2
	24-29	1
Number books in school library	2700 or more	1
Percent of students on double shifts	None	1
Average per-pupil expenditure (System)	over $547*	2
	$461**-$547	1
Minimum to Maximum Score		0-7

The correlations are shown in the second row of Table 8. No correlation is higher than .14; and we conclude that there is no relationship between these measured school characteristics and student growth.

The foregoing method of assessing the relationship between school characteristics and student growth amounts, as indicated, to associating with each student the characteristics of his school, and then measuring the relationship between two characteristics of students: their school qualities and their growth. Another method is to measure the relationship between schools' scores on the two quality indices and the average growth scores of their students. The results of this approach are shown in Table 9.

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* Mean plus one sigma as reported on p. 2-12 of Studies of the American High School.

** Mean plus half a sigma.

Table 9. Correlations between school scores on quality indexes and schools' mean student growth scores.

	Literature		Social Studies		Mathematics	
	Males	Females	Males	Females	Males	Females
Teacher Quality	.05	-.06	.03	-.02	-.11	.02
Academic Investments	-.27	-.25	-.24	-.01	-.05	.00

For the most part, no different impression is gained from this method as compared to the one discussed above. In the case of literature growth for boys and girls, however (and to a lesser extent, social studies for boys), this method suggests a stronger relationship between academic investments and growth. The difference may be put this way: Schools with high academic investments tend to have students who grow relatively little in literature; but students with low literature growth scores are not as likely to be in schools with high academic investments (although they are still likely).

In other words, the schools that are high on academic investments are likely to have students who are low on literature growth; but the students who are low on literature growth are not as likely ('though still likely) to be in high investment schools.

For present purposes, however, the finding of relevance is that there is very little relationship between academic investments and student growth; and that where there is a slight relationship, it tends to be negative.

Intellectual Ability and Growth

Two tests were administered in 1960 to the ninth graders we are discussing, which we shall tentatively interpret as measuring their then-developed intellectual capacity. These were a test of reading comprehension and a test of abstract reasoning ability. Our question is: To what extent do those abilities at the 9th grade affect cognitive growth between the 9th grade and the 12th grade? Put otherwise, to what extent are high schools' cultivation of growth related to the intellectual ability with which students' start? The correlations are presented in Table 10.

Table 10. Correlations between ninth grade aptitude scores and growth.

	Literature Growth		Social Studies Growth		Mathematics Growth	
	Boys	Girls	Boys	Girls	Boys	Girls
Reading Comprehension	.102	.269	-.153	-.075	.218	.143
Abstract Reasoning	.056	.165	-.088	-.039	.175	.102

Focusing first on reading comprehension, there are six relationships to be examined (reading comprehension with each of 3 growth scores for each sex). In five of those cases (the ones underlined in Table 10), the relationships are statistically significant at least at the .05 level, but they are obviously very small; and, in the case of social studies growth for boys, one of the five is negative. The growth that schools can induce may be significantly related to the ability with which students start, but very little of the variation in growth scores is accounted for by students' initial reading comprehension. (At the most, $.22^2=5\%$ of the variance of boys' growth in mathematics is accounted for.)

Three of the six relationships between abstract reasoning ability and growth are statistically significant (and two of the non-significant ones are negative; a fact that might be worth noting, since they also occur in the case of social studies).

Schools, then, do (except in the case of social studies) tend to a slight degree to generate growth in students in accordance with the students' beginning abilities.

Goals and Role Embracements, and Growth

Stinchcombe has suggested/16 that the regimen of high schools is more clearly understandable as instrumental for some students' goals than for others; and that the more instrumental it is, the more likely that students will at least suffer it gladly. We constructed an "index of goal orientations" for which success in high school might be thought to be instrumental. The index is a sum of points indicated for selected responses to the following items on a "Student Information Blank" administered by Project TALENT in 1960.

Item on SIB	Responses	Points
"I feel I am taking courses that will not help me much in an occupation after I leave school."	Almost never	1
Occupation respondent expects to have.	Professional	1
Age of expected marriage.	23+	1
Income expected 20 years after graduation.	($10,000+)	1
Least amount of income that would satisfy 20 years after graduation.	($7,500+)	1
Greatest amount of education expect to have during lifetime.	(College+)	1
Minimum to Maximum Score		0-6

In four of the six relationships as shown in Table 11, correlation between growth and goal orientation is statistically significant, although again very small -- and again the relationship is negative for boys in the case of social studies growth.

In addition, we constructed an index of the extent to which students "embraced"[17] the role of student independently of its instrumental utility. Embracement

Table 11. Correlations between students' ninth grade goal orientation and growth, and between students' ninth grade embracement of the student role and growth.

	Literature Growth		Social Studies Growth		Mathematics Growth	
	Boys	Girls	Boys	Girls	Boys	Girls
Goal Orientation	.054	.128	-.101	.038	.185	.124
Role Embracement	.039	.118	-.049	-.033	.100	.107

consists of desiring the identity that a role provides, of being able to carry out the role, and of being unself-consciously "involved" or absorbed in the role when playing it. Being, as in all cases, restricted to the items contained in the Project TALENT instruments, we were not able to measure all of Goffman's variables, but selected the items listed below as seeming, on their face, to be related to the concept of embracement. The index again is a simple sum of the points shown for various responses.

SIB Items	Responses	Points
Lack of interest in my school work makes it difficult for me to keep my attention on which I am doing.	Almost never	2
	Not very often	1
I enjoy writing reports or compositions.	Almost always or most of the time	1
I do my assignment so quickly that I don't do my best work.	Not very often or almost never	1
Unless I really like a course, I do only enough to get by.	Not very often or almost never	1

SIB Items	Responses	Points
In class I can't seem to keep my mind on what the teacher is saying.	Almost never	2
	Not very often	1
I don't seem to be able to concentrate on what I read. My mind wanders and many things distract me.	Almost never	2
	Not very often	1
Minimum to Maximum Score		0-9

In two of the 6 relationships shown in Table 11, the correlation is significant, and again tiny -- and again it is negative (if it really exists) in the case of social studies.

Except for social studies, then, we may tentatively conclude that growth is slightly more likely to occur in students who aspire to goals for which high school may be instrumentally meaningful, and in *girl* students who embrace the role of student, than it is in students without those characteristics. But these characteristics are of only the slightest importance in accounting for growth.

Personality and Growth

We had thought to devise from the instruments administered by Project TALENT indexes that might (on their face -- obviously, we were not in a position to explore validity or reliability) tap the personality attributes that Erik Erikson[18] identifies as those characteristics of persons who have successfully negotiated the "crises" of development through adolescence: trust *vs.* mistrust; autonomy *vs.* shame and doubt; initiative *vs.* guilt;

industriousness vs. inferiority; and "identity" vs. "identity-diffusion." Our interest was in whether, or the degree to which, students with optimum personality systems (as defined by Erikson) were better or worse able to grow cognitively under the schools' treatments than those still struggling with unsuccessful resolutions of past stages.

However, the Project TALENT data are stored on tape only in the form of total scores for the five "personality scales" devised by TALENT; and these were clearly not constructed with the same theoretical orientation. TALENT's scales are those described above as "Impulsiveness," "Calmness," "Leadership," "Mature Personality," "Self-Confidence."

The correlations between the scores on those scales and the three growth scores are shown in Table 12.

Table 12. Correlations between ninth grade Personality Scales and Growth.

	Literature Growth		Social Studies Growth		Mathematics Growth	
	Boys	Girls	Boys	Girls	Boys	Girls
Impulse Control	.014	-.015	-.051	-.002	-.022	-.043
Calmness	.014	.023	-.066	-.034	.058	.028
Leadership	.003	.001	.005	-.020	.031	.049
Self-Confidence	.050	.035	-.016	.002	.084	.021
Mature Personality	.002	.074	-.044	-.053	.058	.051

It is apparent that those measured personality attributes are almost completely irrelevant to the amount of cognitive growth that takes place.

Family Background and Growth

Our index of family background, which we thought of as an index of the degree to which the familial environment reinforced the nominal values and presses of the school, was constructed from the following items and points:

SIB Items	Responses	Points
Which of the following best describes your family's finances.	Well-to-do, wealthy, extremely wealthy	2
	Comfortable	1
How many books in home?	3 or 4 bookcases full+ (251+)	3
	2 bookcases full (101-250)	2
	1 bookcase (26-100)	1
How many of following news magazines get regularly? (Life, Look, Newsweek, Time, U.S. News & World Report)	2+	2
	1	1
How many business magazines?	1+	1
Opinion Magazines?	4+	3
	2-3	2
	1	1
"Cultural" Magazines?	4+	3
	2-3	2
	1	1
Father's occupation	White collar+	1
Father's education	College+	2
	High School, Vocational and business school, some college	1
Mother's education	College+	2
	High School, Vocational and business school, some college	1
Minimum to Maximum Score		0-19

Here again, as shown in Table 13, in only two cases is the correlation as high as .10 -- and in one of those (social studies for boys) it is negative. Familial reinforcements, we conclude, are also virtually irrelevant to growth.

Table 13. Correlations between Family Reinforcement and Growth.

Literature Growth		Social Studies Growth		Mathematics Growth	
Boys	Girls	Boys	Girls	Boys	Girls
0.043	.046	-.105	-.028	.029	.138

SCHOOL DIFFERENCES AND NON-SCHOOL INFLUENCES

One of our basic interests, however, was in the possibility that different kinds of schools were differentially functional or dysfunctional in inducing growth for different kinds of students. This is a possibility, it will be recalled, suggested by some of the Project TALENT data reported above. We have investigated this by dividing the 88 schools into quintiles on the basis of the Teacher Quality Index and into thirds on the basis of the "Academic Investments" index, and then calculating the correlation between growth and each of the non-school indexes within each category of schools. We are asking, in effect, whether the relationship between growth and (for example) initial ability is affected by varying levels of teacher quality or academic investments.

In the case of academic investments, there were, then, three correlation coefficients for each relationship between growth and an independent variable -- one for students in the 30 schools with the greatest academic investments, one for students in the 37 schools with the second greatest academic investments, and one for students in the 21 schools with the least academic investments. For each sex there were 90 correlation coefficients (ten independent variables by 3 dependent variables by three categories of schools). These are shown in Tables 14 and 15.

Focusing only on the instances in which at least one of the three r's for each independent-dependent relationship was 1.0 or larger, we looked first for evidence consistent with the hypothesis that the "better" the school (as measured by academic investments) the greater the effect of a predisposing variable on growth. That is, we asked whether there was any evidence that better schools cultivated initial predispositions into intellectual growth more effectively than poorer schools. We arbitrarily adopted the extremely liberal standard that such "evidence" would consist of the r for the better school being at least .05 greater than that for the poorest school, with the r for the "medium" school lying between the other two.

In only 3 out of a possible 90 instances among boys was such evidence found -- namely, in the cases of reading ability and literature growth; abstract reasoning

Table 14. Correlations between selected ninth grade characteristics and growth, within schools that were High, Medium, or Low on academic investment, Boys.

	Literature			Social Studies			Mathematics		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
1960 reading	.0937	-.0577	.1451	-.1749	-.1390	-.1096	.2788	.1463	.2652
1960 reasoning	.0914	.0127	.1496	-.0411	-.0731	-.0397	.2023	.1762	.1487
Goal orientation	-.0046	.0843	.0792	-.0913	-.0820	-.1020	.1715	.2170	.1241
Role embracemenet	.0991	-.0165	.0911	-.0510	-.0512	-.0346	.1524	.0314	.1442
Familial reinforcement	-.0538	-.0265	-.0357	-.0117	-.0317	-.1791	.0577	.0516	-.0010
Impulse control	-.0787	.0627	-.0442	-.1068	-.0245	-.0267	.0353	-.0546	-.0874
Calmness	-.0533	.0309	.0115	-.0513	-.0348	-.0839	-.0109	.0864	.0922
Leadership	-.0691	-.0150	.0176	.0452	.0013	-.0152	.0550	.0311	.0057
Self-confidence	.0456	.0760	.0001	-.0715	.0022	.0420	.1325	.0219	.1390
Mature Personality	-.0794	.0346	-.0082	-.0647	-.0176	-.0565	.0426	.0313	.0766

Table 15. Correlations between selected ninth grade characteristics and growth, within schools that were High, Medium, and Low on Academic Investments, Girls.

	Literature			Social Studies			Mathematics		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
1960 reading	.2540	.2734	.2322	-.0524	-.0604	-.0936	.0365	.1597	.1729
1960 reasoning	.0955	.1355	.2306	-.0157	-.0245	-.0536	.0279	.0954	.1182
Goal orientation	.0830	.1462	.1708	.0718	.0261	-.0054	.1001	.1040	.1260
Role embracement	.1463	.1272	.1095	-.0080	-.0223	-.0648	.0947	.0633	.1700
Familial reinforcement	-.0839	.0595	.1102	.0004	-.0061	-.0728	.1171	.1322	.0825
Impulse control	-.0256	.0045	-.0417	.0322	-.0219	-.0524	.0480	-.0073	.1047
Calmness	-.0090	.0473	.0250	-.0669	-.0436	-.0175	.0213	-.0360	-.0047
Leadership	.0249	.0285	-.0128	-.0467	-.0520	-.0004	.0119	.0380	.0325
Self-confidence	.0102	.0602	.0190	.0016	-.0172	.0220	.0120	.0368	-.0469
Mature Personality	.1092	.0828	.1254	-.0235	-.0653	-.0941	.0134	.0273	.0785

ability and literature growth; and reading ability and social studies. In this last case, however, it is necessary to say that the "better" schools differed from the "poorer" ones in that they reduced the negative correlation between reading ability and social studies more than did the poorer schools. The negative correlations, of course, may be entirely an artifact of the construction of the growth scores: Since reading scores and point-in-time social studies scores are highly correlated (see Table 4), it may be that the ninth grade good readers who scored high on social studies in the ninth grade could not "grow" very much -- they were already near the ceiling. They would then appear among those who grew least; and one would expect the negative correlation that is observed.

Among girls, there are five cases (out of 90 possibilities) meeting the liberal criterion we have established: "Better" schools seem more effectively than "poorer" schools to exploit initial abstract reasoning ability; initial familial reinforcement, and initial goal-orientation for growth in literature; and they seem more effectively to exploit initial reading and abstract reasoning abilities for growth in mathematics.

Thirdly (and fourthly), we looked for evidence consistent with the hypothesis that the effect of school quality (as measured by academic investments) on the relationship between predisposition and growth was U-shaped (or inverted U-shaped). A U-shaped relationship would suggest that predisposition affected growth mostly in schools that were either very good or very poor, but not in schools that were "medium."

Such a finding would be consistent, for example, with the hypothesis that "poorer" schools did so little genuine educating that how much a student grew was largely a function of his beginning characteristics; while "better" schools did such an excellent job of educating that each student was helped to grow as much as his initial characteristics permitted. (Such a finding would be consistent with such a hypothesis -- it would obviously not prove it. There are other hypotheses that would predict the same finding -- a point we shall return to later.)

An inverted U would suggest that predispositions were in some way prevented from affecting growth in schools that were either very good or very poor, and were "permitted" or "helped" to do so in "medium" schools. Such a finding would, for example, be consistent with the hypothesis that poor schools were unable to cultivate predispositions into growth, while better schools tailored their treatments to students' predispositions so adroitly that growth occurred in students regardless of their predispositions. In schools which were not "good" enough to tailor treatments to student needs but were good enough to cultivate what they received into growth (i.e., the "medium" schools) there would be the highest relationship between predispositions and growth.

Among boys, there are four instances (out of 90 possibilities) of the U-shaped relation. It may be that both high and low academic investments in some way (or perhaps in different ways) make initial reading ability a better predictor of growth in literature than do intermediate investments; and make reading ability, role-embracement, and self-confidence better predictors of mathematics growth. Among girls there are no instances.

There are no instances of the inverted-U possibility among either boys or girls.

We conclude that such things as class size, number of library books, double shifts, and per pupil expenditures do not influence the relationship between growth and predispositions.

Teacher Quality and the Relationship Between Predispositions and Growth

Schools were divided into quintiles on the basis of the teacher qualities described above; and the same four hypotheses were investigated as we have just reviewed in the case of academic investments.

The correlations are shown in Tables 16 and 17. Our criteria here are as follows:

1. Evidence for the hypothesis that the better the school the higher the correlation will consist of instances in which the correlation between a predisposition and a growth score in the "best" schools (5th quintile) is at least .10 higher than that in the "worst" (1st quintile) schools;

Table 16. Correlations between selected ninth grade student characteristics and growth within quintiles of schools arrayed on an index of Teacher Quality, Boys. (First quintile is "Low")

Literature

	1	2	3	4	5
1960 Reading	-.0371	.0532	.2273	.1486	.0565
1960 Reasoning	-.0252	.0056	.1392	.0957	.0762
Goal Orientation	-.0183	.1870	.0246	.0993	.0251
Role Embracement	.1000	.0563	.1345	.0026	.0160
Familial Reinforcement	-.0978	.1021	.0996	-.0456	-.1237
Impulse Control	.0961	-.0208	-.0067	.0107	-.0364
Calmness	-.1323	.0733	.0802	.0635	-.0570
Leadership	-.0828	.0753	-.0343	-.0668	.0194
Self-Confidence	.0416	.0312	-.0915	.1148	.0184
Mature Personality	-.0710	.0017	.0756	-.0043	-.0211

Table 16. Correlations between selected ninth grade student characteristics and growth within quintiles of schools arrayed on an index of Teacher Quality, Boys. (First quintile is "Low")

Social Studies

	1	2	3	4	5
1960 Reading	-.2380	-.1529	-.1911	-.0972	-.0982
1960 Reasoning	-.0896	-.0004	-.1180	-.0146	-.0656
Goal Orientation	-.0842	-.0710	-.1957	-.0110	-.1001
Role Embracement	-.1148	.0300	-.1848	-.0443	-.0390
Familial Reinforcement	.0061	.0755	-.1417	-.0646	-.1402
Impulse Control	-.1418	-.1324	.0418	.0185	-.0617
Calmness	-.1264	-.0437	-.0513	-.0596	-.0506
Leadership	-.0700	-.0665	-.0168	.0235	.0292
Self-Confidence	-.0311	-.0416	-.0535	-.0072	.0214
Mature Personality	-.1563	-.0559	-.0881	.0031	-.0425

Table 16. Correlations between selected ninth grade student characteristics and growth within quintiles of schools arrayed on an index of Teacher Quality, Boys. (First quintile is "Low")

Mathematics

	1	2	3	4	5
1960 Reading	.3456	.0542	.2385	.2888	.1923
1960 Reasoning	.1824	.1828	.0584	.1865	.2427
Goal Orientation	.4132	.1596	.0969	.1167	.1976
Role Embracement	.1770	-.0219	.1426	.1433	.0905
Familial Reinforcement	.0802	.0928	.0497	-.0066	.0153
Impulse Control	.0342	-.0545	-.0729	-.0120	-.0497
Calmness	.1606	.0267	-.0191	.0626	.0871
Leadership	.1328	.0310	-.0890	.0817	.0288
Self-Confidence	.1350	-.0271	.0469	.1605	.0917
Mature Personality	.1401	.0215	-.0064	.0654	.0489

Table 17. Correlations between selected ninth grade student characteristics and growth within quintiles of schools arrayed on an index of Teacher Quality, Girls. (First quintile is "Low")

Literature

	1	2	3	4	5
1960 Reading	.0197	.5052	.3058	.2811	.2423
1960 Reasoning	-.0639	.1834	.2634	.2131	.1388
Goal Orientation	.1154	.2142	.1564	.2022	.0639
Role Embracement	-.0446	.2078	.0983	.1467	.1170
Familial Reinforcement	-.0531	-.0192	.0868	.0852	.0447
Impulse Control	.1410	.0133	-.0689	-.0499	-.0215
Calmness	.0557	-.0043	.0015	.0666	-.0069
Leadership	-.0376	.0933	-.0996	-.0077	.0424
Self-Confidence	.0932	.0246	-.0532	.0834	.0033
Mature Personality	.0426	.1585	.0573	.0542	.1449

Table 17. Correlations between selected ninth grade student characteristics and growth within quintiles of schools arrayed on an index of Teacher Quality, Girls. (First quintile is "Low")

Social Studies

	1	2	3	4	5
1960 Reading	.0019	-.0357	-.0577	-.0443	-.0739
1960 Reasoning	-.0976	.0246	.0002	-.0113	-.0090
Goal Orientation	.2350	.0739	-.0452	-.0148	.0474
Role Embracement	.0900	-.1466	-.1464 ~~-.0002~~	-.0062	-.0119
Familial Reinforcement	-.0312	.0639	-.0736	-.0327	.0069
Impulse Control	-.0029	-.0752	4.1682	-.0034	.0825
Calmness	.0977	-.1212	-.1378	-.0699	.0245
Leadership	.0489	-.0550	-.1951	-.0771	.0409
Self-Confidence	.0694	-.0173	-.0871	-.0386	.0570
Mature Personality	.0900	-.2159	-.2318	-.0538	-.0003

Table 17. Correlations between selected ninth grade student characteristics and growth within quintiles of schools arrayed on an index of Teacher Quality, Girls. (First quintile is "Low")

Mathematics

	1	2	3	4	5
1960 Reading	.2646	.0191	.1935	.1311	.0371
1960 Reasoning	.0519	-.0411	.1729	.0988	.0536
Goal Orientation	.2497	.0945	.1311	.1035	.0579
Role Embracement	.0923	.0648	.1937	.0769	.1062
Familial Reinforcement	.2652	.2168	.0176	.0903	.0556
Impulse Control	.2561	-.0742	.0632	.025~~0~~6	.0318
Calmness	.0483	-.0055	.0705	-.0585	-.0375
Leadership	.0523	.0545	.0990	.0197	-.0354
Self-Confidence	.0676	.0593	.0471	-.0565	-.0428
Mature Personality	.2404	-.0295	.0375	.0382	.0146

and correlations in intermediate schools do not break the pattern of increase (or constancy) from 2nd through 5th quintiles.

2. Evidence for the hypothesis that the better the school the lower the correlation, will consist of instances in which the above patterns are reversed.
3. Evidence for the U-shape hypothesis will consist of instances in which the correlation between a predisposition and a growth score in any of quintiles 2, 3, or 4 is lower than those in quintiles 1 and 5 by at least .10; and in which the r's in the other two of the three middle quintiles do not break a U pattern.
4. Evidence for the inverted U hypothesis will consist of instances in which the r's in quintile 1 and 2 are at least .10 lower than one of the r's in quintiles 2, 3, or 4; and in which other r's do not break the pattern.

Hypothesis 1. There are no instances in support of this hypothesis among either boys or girls, out of 30 possibilities for each sex.

Hypothesis 2. There are no instances among either sex that precisely meet all the criteria of evidence stated above; but if the criterion of perfect pattern-consistency is relaxed very slightly, one instance is observed among boys; and five among girls. Among boys, it is possible that the higher the teacher quality the lower is the negative relationship between initial reading ability and social studies growth. Among girls, it may be that the better the school in terms of teacher quality the less is the relationship between Goal-Orientation and social studies growth; and the less is the relationship between mathematics growth and Goal Orientation, familial reinforcement, impulse control, or "mature personality."

Hypothesis 3. There are two instances in which this hypothesis is supported among boys; none among girls. Among boys, it may be that both good and poor schools raise the predictive value of abstract reasoning and initial goal orientation for mathematics growth, while "in-between" schools depress it.

Hypothesis 4. If the criteria stated above are relaxed very slightly, there are 9 instances in support of this hypothesis -- two among boys and seven among girls. Among boys it is possible that both good and bad schools, as compared to "intermediate" schools, depress the relationship between literature growth on the one hand and on the other reading ability and goal orientation. Among girls, it may be that both good and bad schools tend to depress the relationship between---

- literature growth, and reading and abstract reasoning ability;
- social studies growth, and impulse control, leadership, and "mature personality";
- mathematics growth, and abstract reasoning ability and role embracement.

The paucity and inconsistency of evidence in support of any kind of effect of teacher quality on the relationship between predisposition and growth lead us to reject the hypothesis that there is any.

DISCUSSION

It does not look as though any of the usually-measured aspects of schools have much to do with student achievement or growth. But it must be promptly added that it does not look as though many of the often-measured aspects of the students themselves or their family backgrounds do, either.

Neither of these findings should be surprising, when one stops to think about them. In the first place, it should be obvious that such things as the number of books in a school library, the size of school classes, or the size of per-pupil expenditures cannot as such have anything to do with how much children know or how much they learn. When there are many books, most of them may be repellingly dull or incomprehensible, they may be kept in locked cases either literally or bureaucratically, and the librarian may be most of the time supervising study halls and the rest of the time ignored by the teachers. In the smallest of classes it is possible to teach the greatest nonsense in the densest way; and the cost of driver education and band instruments may skyrocket per-pupil expenditures, not to mention books that get locked up in the library.

In the second place, the issue of "which is more important -- students' backgrounds or school characteristics?" -- is another version of the heredity-environment issue that we have learned not to raise, because the question is put wrongly: The reasonable question is, under which environmental (school) circumstances do individuals with which characteristics (heredities) flourish best?

Let us suppose that the approach of the Coleman study were to be applied not to schools, children and verbal achievement score, but (in tandem analogy) to horticultural stations, plants, and the health of plant leaves. Let us suppose, secondly, that different kinds of plants require different amounts or kinds of sunlight, fertilizer, space, water, warmth, etc.; and, thirdly, that all horticultural stations were alike in the sense that they had one standard treatment that they applied to all plants regardless of the plants' "natures" ("backgrounds").

If we now found the variance of the health of the leaves, and tried to account for it, what would we discover? We would observe that little of the variance lay between stations;[19] most of it lay *within* stations, and most of it was accounted for by the plants' "backgrounds."

If we observed such a distribution of the variance, could we conclude that "horticultural stations make no difference," or even that "they make no difference for plant equality of opportunity"? It should be clear that we could not. Horticultural stations, under the improbable assumptions we made above.* are obviously making a great difference: they are sorting plants very successfully into those that do and those that do not respond successfully to the treatment given them. They are also providing precise equality of plant opportunity -- to respond or not to respond to a given treatment; and they are efficiently and effectively *denying* equality of plant opportunity to develop healthy leaves.

Is this what schools are doing?

That question needs to be asked another way. Since Coleman's analysis of variance in the school study found precisely the pattern that would be generated by the horticultural behavior described above, does it follow that schools are doing to students with respect to verbal achievement what we described horticultural stations as doing to plants with respect to leaf-health? No; it does not, because there are other kinds of behavior that would generate exactly the same pattern.

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*Improbable in the case of horticultural stations; not so self-evidently improbable in the case of schools.

Dropping the analogy, let us see what they are. Let us consider all the possibilities of student heterogeneity or homogeneity of salient backgrounds and all the possibilities of heterogeneity or homogeneity of school treatments, and their possible pairings. By "salient" backgrounds we mean those that, if they exist, [illegible] require different kinds of treatments if students are to "flourish."

Relevantly to our purposes, we may distinguish four possibilities of student (salient) backgrounds. (1) Students are alike in all schools; (2) they are homogeneous within schools but heterogeneous between schools; (3) they are heterogeneous within schools; (4) some schools contain homogeneous students, others contain heterogeneous students.

Regarding school treatments, we may distinguish three major possibilities: (1) Treatments are homogeneous between all schools; (2) they are homogeneous within schools but heterogeneous between schools; (3) they are heterogeneous within schools. Each of the last two possibilities has two sub-possibilities: the heterogneity of treatments may be either (a) appropriately or (b) inappropriately applied to -- that is, matched with -- heterogeneous students.

These possibilities are cross-tabulated in Table 18. In the cells of the table are written the pattern of variance of student achievement scores (after some years of exposure) that would result from each combination of the possibilities distinguished.

A. There are five sets of circumstances that could generate the Coleman finding of (a) large variation (b) mostly lying within schools. (The numbers below correspond to the numbers of the cells in the table.)

5. Students are homogeneous in all schools (that is, students are all alike everywhere), but schools do not know this and mistakenly (or perhaps accidentally) apply different treatments to students who seem saliently different (or perhaps apply treatments that only seem the same to the school staff).

10. Students are homogeneous within schools, but different schools have different collections of homogeneous students; and schools apply varying treatments to different ones of their own students -- in some pattern such as those described in 5, above.

11. Students are heterogeneous within schools; and all schools give the same standard treatments to all students.

13. Students are heterogeneous within schools, all of which give homogeneous treatments to their own students, even though schools differ from one another in their treatments.

Table 18. Pattern of variance expected from various combinations of heterogeneity-homogeneity of student backgrounds and school treatments.

	Treatment	**Treatment**		**Treatment**	
	Homogeneity between all Schools	Homogeneity Within Schools But Heterogeneity Between		Heterogeneity Within Schools	
		Appropriate	Inappropriate	Appropriate	Inappropriate
Students alike in all schools	(1) Small Variance	(2) Not applicable	(3) Large Variance; Between Schools	(4) Not applicable	(5) Large Variance; Within School
Students Homogeneity within Schools but Heterogeneity Between Schools	(6) Large Variance; Between Schools	(7) Small Variance	(8) Large Variance; Between Schools	(9) Not applicable	(10) Large Variance; Within School
Students Heterogeneity Within Schools	(11) Large Variance; Within School	(12) Not applicable	(13) Large Variance; Within Schools	(14) Small Variance	(15) Large Variance; Within Schools
Some Schools Homogeneity; Others Heterogeneity	(16) Large Variance; Between and Within	(17) Large Variance; Within and Between	(18) Large Variance; Within and Between	(19) Small Variance	(20) Large Variance; Within and Between

15. Students are heterogeneous within schools; and schools vary the treatments they give students according to the students' backgrounds, but do so inappropriately.

B. The pattern that would appear if schools "made a difference" in the sense that Coleman and Project TALENT had in mind -- that is a pattern of (a) large variation (b) lying mostly between schools -- would appear under three different sets of circumstances -- namely:

3. Students are homogeneous within and across all schools, but some schools give one kind of treatment to all their students and other schools give different kinds of (homogeneous) treatments to all their students -- most of which treatments, by definition, would be inappropriate.

6. Students are homogeneous within each school but differ from school to school; and every school gives the same treatments as every other school.

8. The same situation with respect to students as in 6, but without the monolithic sameness of treatments across schools. The different treatments applied by different schools to their internally homogeneous population are, however, not appropriately matched to those salient student backgrounds.

C. In four possible sets of circumstances there would be large variation, and it would be both within and between schools. Those are all circumstances in which some schools have homogeneous student bodies and others have heterogeneous, and in which--

16. Schools are monolithic in their treatments.

17. Schools vary from one another in terms of treatments but each school gives the same treatment to all its students, and the between-school treatment differences are appropriately matched to the needs of their student bodies when those student bodies are homogeneous. (By definition, they could not be appropriately matched when a student body is saliently heterogeneous.)

18. The same situation as in 17 but with school homogeneous treatments being inappropriately matched to homogeneous student bodies (as well as, necessarily, to heterogeneous student bodies).

20. Schools give different treatments to different members of their own student bodies, but inappropriately match treatments to backgrounds.

D. Finally, it is worth noting the circumstances in which one would find rather small variance. There are four conditions which would produce such a finding:

1. Students are students everywhere and they all receive the same treatments regardless of which school they attend. (It may be worth emphasizing here that this situation could generate small variance; the mean around which scores varied

could be low or high depending on the appropriateness of the monolithic treatments to the students' backgrounds.)

7. Different kinds of students go to schools that are "segregated" by those salient characteristics; the different schools specialize in different kinds of treatments; and the treatments are appropriately matched to backgrounds. (This would be a precise definition of "separate but equal.")

14. The student body of each school is heterogeneous; each school gives different treatments to different members of its student body; and the treatments are appropriately matched to backgrounds. (This, as the terms are generally used today, would be "integrated education in a large and efficiently run comprehensive school." It, of course, is the situation that very probably prevails in the case of horticultural stations.)

19. Some schools have homogeneous student bodies, others have heterogeneous; each school varies its treatments to match the needs of its students, and does so appropriately. (This would be a pluralistic system in which all school administrators were intelligent and all teachers and staff members were competent.[20]

Research Implications

We have so far argued two things: (1) That it is useless to expect meaningful correlations between gross school characteristics such as library collections and student performances, since there is no reason to suppose any necessary mediating connection between the two. (And, correlatively, we are arguing that from a finding of no relationship it cannot be inferred that school libraries are necessarily irrelevant to student performance; everything depends on *what goes on between* students and libraries.) (2) That there are several different combinations of circumstances that can generate all the possible observations of variance distribution or correlations. (Correlatively, from a pattern of variance one can infer nothing about what generated it.)

We can put both arguments together in the proposal that the research that badly needs to be done is research on the relationships among (1) salient background and personal characteristics of students, (2) the in-school treatments to which they are exposed, (3) the school structures and processes that result in an appropriate or inappropriate match of treatments to characteristics, and (4) students' intellectual and other growth. Each of these terms requires further elaboration.

Salient Background and Personal Characteristics

Whatever the influence of family background on children, it must in its relevant aspects show up in some characteristic of the student that is relevant to his school role. It may (or may not) be that having been read to when young, or having many books in the house, or having parents who talk a lot about school, and so on affect in an invariant way a child's intellectual or emotional ability or motivation to play a given student role successfully. Such things probably do,[21] but the point to be emphasized is that they do so _by_ affecting some observeable intellectual or emotional ability or motivation. It is fairly obvious, in other words, that different children bring to school, and to any grade in school, different cognitive "schema" or styles;[22] different degrees of trust or mistrust, autonomy or shame and doubt, initiative or guilt, industriousness or inferiority, identity or identy-diffuseness;[23] need-achievement, need-absement;[24] activity or passivity, pattern-focusing or person-focusing, alienation or conformity orientation;[25] and so on.

Our point is that it is some such characteristic as those that are _salient_ for affecting children's embracement of or distance or alienation from the student role. They, then, are the student characteristics that need to be identified and measured. So far as family backgrounds are concerned,their relevance lies in their contribution to those salient student characteristics; and this is an area in which a great deal of research is needed before it makes sense to attempt to "account for" student performance in terms of family backgrounds.

If it is found that certain family characteristics are associated with any of those salient student characteristics, then family backgrounds would be relevant in two ways. First, knowledge of the family structure might be a useful basis for classifying students into those with certain treatment needs and those with other needs; and second, it may be possible to influence the facilitating or impeding features of families. Both of those potential relevances of family backgrounds, however, remain only potential until linkages are established between family structures and salient student characteristics; and until linkages are established between those student characteristics and differential "treatment" needs. We shall return to this last point below.

In-School Treatments

To use the horticultural analogy as a launching pad, it is not at all clear what the educational analogies of fertilizer, nitrogen, water temperatures, etc. are in the cultivation of human intellectual potentials. "Progressive" vs. "classical" education are much too vague and imprecise designations; and "alphabet learning" vs. "phonics" vs. "whole word learning" are, so far as we know, usually debated in all or none terms without notice of the possibility that one method may be appropriate with one kind of student and another with another. Again, the "Dick and Jane" vs. "Brown-faces-and-urban-scenes" controversy is too freighted with speculative sentiment and ideology to be illuminating.

From the work of Sigel, Hunt, Erikson, and Parsons cited earlier, and from the work of Bruner,[26] it should be possible to begin to distinguish systematically and relevantly among different pedagogical methods and techniques, which would be a first step to a rational association of methods with student needs.

The point is that, however important it is to ascertain the familial sources of various salient student characteristics in the hope of optimizing them, it is at least equally important to accept those characteristics, once present, as given; and then to ascertain *what their implications are* for children's embracement of or distance or alienation from *various structurings* of the student role. Do children with a high degree of initiative learn arithmetic under an approach that is lethal to children with a great deal of guilt, and vice versa? Is there a way of teaching reading that is functional for children who have the stored imagery of Dr. Seuss and that is dysfunctional for those who have only the stored imagery of Beatle lyrics? Do children who display "spoiled" characteristics learn better, regardless of the reading *method*, under teachers who are permissive or under drill sergeants?

It is such questions as these, concerning educational techniques, teacher styles, and teacher-student transaction modes; and the impact of each on students with differing characteristics that need research emphasis now. But there is one ubiquitous "treatment" of students on which reasonable comment may be made without further research ado. That is testing.

The fact is that the proper educational function of tests (of all kinds -- of skills, knowledge, "intelligence," "ability," "personality," etc.) is to discover what has been the result, in the relevant area, of the interaction between the individual and his experiences. What is commonly called "failure" on a test, then, is much more productively understood in very different terms: It is a signal that whatever the individual's experiences with teaching style or pedagogical methods or whatnot, had been, they were not the ones required to give him the qualities that would have resulted in a different score.

That, logically, semantically, and scientifically, is all that a test score means. Any test, in other words, is a more or less valid and reliable indication of how effective the educational methods (or socialization patterns or therapeutic programs) to which the individual had been exposed, had been in his case. Properly understood, then, tests (in an educational setting, if not necessarily in an occupational placement setting) are opportunities for testers and test-takers to diagnose what was wrong with the experiences of the test-taker and what is suggested by the pattern of errors as the proper remedy.

(This, it is more frequently understood, is the sole function -- in a medical setting if not necessarily in an occupational placement setting -- of a test for blood sugar; and what must be understood is that a test of "intelligence" or of"achievement" is in no way different.)

This understanding is of crucial importance for any educational enterprise. For students it can mean freedom from the self-defeating sense of personal failure that often results from conventional interpretations of low test scores; and for both students and instructors it can serve as a built-in quality control mechanism leading to constant refinement of the educational procedures.

What this implies concretely is that each test must be the occasion on which teachers and students sit down together and try to figure out, from the pattern of the student's errors and his introspective accounts of his processes of making them,what new experiences he needs in order to avoid them the next time.

The Matching of Treatments and Needs

In many schools there are now, of course, various "trackings" and"groupings." It is not at all clear, however, how many of these are anything but classifications of students into those who respond well, fairly, and poorly to a standard treatment; or that, if the treatments vary, how many vary in any way other than high, medium, and low teacher expectations -- with the attendant danger of their being self-fulfilling prophecies.

Above all, we do not know to what extent, from the perspectives of students and teachers, their reciprocal dependencies on one another are balanced; or the effect of various kinds and degrees of imbalance on students' growth (or, for that matter, on teachers' morale and effectiveness). The kind of research needed here may be conceptualized in the following manner.

Students and teachers are engaged, wittingly or not, in a series of transactions with one another and with the other partners in their role-sets and status-sets, in which teachers supply certain outputs and demand certain inputs, and students do the same. The outputs supplied by the teachers either are or are not quantitatively or qualitatively the inputs demanded by the students, and vice versa; and the inputs demanded by teachers either are or are not the outputs students want or are able to supply -- and also vice versa. Moreover, both the inputs and outputs exchanged (or not exchanged) either are or are not the ones that would maximize student growth.

The first need in pursuing this kind of analysis is a conception of the crucial inputs and outputs involved in the transactions.

The suggestion here is that the critical outputs of teachers might be conceptualized as those socialization inputs noted by Parsons and Hunt as crucial for optimum emotional and intellectual development: Support, clear information, opportunities to exercise initiative and to express and experience autonomy, denial of reciprocity, rewards, permissiveness, opportunities to manipulate objects, corrective discussion, and so on. Students' outputs to teachers may be thought of as behaviors indicating the traits that Erikson notes as optimum results of socialization (trust, initiative, autonomy, industry, identity), and such other behavioral outputs as competence, respect, reliability, appreciation, and so on.

With respect to both teachers' and students' outputs to one another the important issues would seem to be:

1. How much each supplier sees himself as supplying.
2. How satisfied the suppliers think the receivers are with that rate and kind of output.
3. How satisfied the receivers actually are.
4. How satisfied suppliers are with respect to receivers' acceptance of the outputs.

5. How suppliers handle receivers under-acceptance of or over-demandingness for outputs.
6. How receivers handle suppliers' over- or under-supply of outputs.
7. How satisfied receivers think suppliers are with the receivers' acceptance of suppliers' outputs.

Other Role Relations of Teachers

Teacher-student relations do not, obviously, exhaust the complexity of a school as a social system. Teachers have transactions with principals, with other teachers, and with other persons in their status-sets; they have various orientations to and identifications with their teacher role; and that role stands at a certain point in each teacher's actual and anticipated status-sequence. All of these factors help to comprise the total school environment that is the social "Skinner Box" in which students learn either to be "good students" or something else.

What teachers supply to and accept and demand from one another would seem to be an important determinant of what they are able and willing to supply to and demand or accept from students. It should, theoretically, for example, make a difference how much personal support teachers get from one another in a profession in which the rewards from students and from parents, not to mention the public and taxpayers, may be un-munificent and are probably variable at best. And in what interests the mutual support, if any, is harnessed would seem to be significant also -- whether, for example, in the maintenance of a task-oriented climate, of intellectual stimulation, or of a kind of "us-against-them" mutual protection society against the "administration."

Each of these dimensions needs to be measured as part of a complete analysis of schools as social systems.

In addition, there are outputs by principals that probably affect teachers' embracements of their roles and hence their relations with students -- and hence students' growth. As the critical principals' outputs, we would single out the following:

- Personal friendship
- Supervision
- Sanctions
- Instrumental support
- Technical administrative efficiency
- Respect for teachers' autonomy

On the other side of the teacher-principal "market" are the things teachers may be expected (or may want) to supply to principals. We distinguish two broad categories of such teachers' outputs: Manifestations of professional enterprise and commitment; and "bureaucratic dutifulness."*

With respect to principals' outputs to teachers, teachers must be asked about how they perceive the quantities of each output supplied; and principals must be asked a corresponding question. With respect to teachers' outputs to principals, teachers must be asked about how satisfied they are with their principals' acceptance of or demand for them; and principals must be asked how satisfied they are with teachers' supplies.

Teachers' relationships with and conceptions of their teaching roles can be partly measured in the ways already described; but in addition, certain other aspects must be investigated. Teachers' career patterns and the degree of their embracement of their roles is one such aspect; their conceptions of their students' future lives and of their ability to influence those futures is a second; a third is their particular ways of "explaining" differential student success or failure; a fourth is their definitions of why students should exert effort; a fifth is their conceptions of the actual nature of the student-teacher relationship (a "tug of war"? A "team effort"? "Cops and robbers"?); and a sixth is their views on pedagogical matters of general concern (homogeneous groupings, ways of improving school effectiveness.)

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*Operational definitions of these concepts have been tentatively worked out in the instruments designed for a study of which this section is the theoretical rationale.

Other Role Relations of Students

The teacher-student relationship is no more the only significant one for students than it is for teachers. To one another, students supply -- or may supply -- personal support, a task-oriented climate, sanctions, stimulation, an "us-against-them" mutual defense, and, as a part of the youth culture, more or less hedonistic experiences. Vis-a-vis parents (and here, of course, we are returning to a refinement of one of the non-school factors discussed earlier), students supply in greater or lesser amounts (and see parents as being more or less satisfied with, and are themselves more or less satisfied with parental acceptance of) sanctions, conformity, independence, and help at home. They are themselves as receiving from parents more or less pressures and help to succeed in school, support, opportunities for autonomy and initiative, sanctions, advice, firmness, and chores.

Of further significance for students' responses to the school environment are their anticipated status-sequences and their perceptions of the relationship of their present statuses to those futures. The "existential positions"* they currently have as a result of their success or failure in coping with Erikson's various "crises"** must also affect those responses; and therefore need to be measured.

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* cf. Eric Berne, The Games People Play (N.Y.: Grove Press) 1966.

** Berne does not relate "existential positions" to Erikson's typology; life stages; that is a suggestion of the present writer.

Still further, the level and "balance" of teacher-student relations is likely to be affected by the relationship between students' and teachers' views on several issues mentioned above in the context of teachers' perceptions: homogeneous groupings, reasons for students' success or failure, the actual nature of the student-teacher relation, and rationales of "why students should try."

Finally, as a factor affecting students' abilities and willingness to accept teachers' outputs or to supply what teachers demand, there is the critical role of the congruence or incongruence of students' self-images and their ego-ideals in the context of the several different sorts of cultural demands often made on them -- those associated with various aspects of the adult culture and various aspects of the youth culture.

The dynamics of the school as a system, in short, are to be understood in terms of the equilibrium and the level of the transactions among school personnel. These transactions are a joint product of the "needs" and adaptive modes of those personnel, and in turn affects the growth experiences of students. When we learn how to distinguish among schools in terms of their various patterns of transaction and types and levels of equilibrium, using such indexes as those just briefly reviewed, we can then attempt to relate such dynamics to differential student growth. This, it is the present suggestion, will throw considerably more light on the determinant of student development than can be thrown by the more "static" kinds of correlation of student achievement growth with gross and external school characteristics that were described in the first part of this paper.

Students' Intellectual and Other Growth

To cause or to help students to grow is, we assume, the main function of schools; and it is on the assumption that personal and background characteristics, school treatments, and various role interactions inside and outside the school have something to do with that growth that we justify studying those phenomena. But "growth" on "intellectual" and "other" dimensions is itself a complex concept, and considerable clarification is needed of it.

We have already spoken of the obvious limitation of the index of growth used in the analysis of Project TALENT data reported above, but there are further difficulties as well. First of all, there is the problem of delineating the purely cognitive dimensions along which it might be thought that students should grow. It would probably not be difficult to get consensus on the dimensions of mathematical competence, reading comprehension, understanding of history and of the operation of the student's society, and perhaps of the biological and physical worlds. But on the issues of how much or what kind of understanding and competence on those issues consensus might be more difficult. It would probably be even more difficult on the issue of how much and what kind of competence in mathematics, for example, third graders should have as compared to sixth graders, sixth graders as compared to twelfth graders, and so on.

J. McV. Hunt,*for example, suggests same of the difficulties involved, in a description of a special program to improve the arithmetic comprehension of students in a private school. He writes:

> "....As a member of the board of directors of this school, in charge of examining the educational records, the writer directed an analysis of the scores made by the children in each grade on the Metropolitan Achievement Test of arithmetic. Originally this analysis was made without any particular interest in assessing the effects of this teaching method. It was merely a project of the parent-teacher organization, done simply to see how well the children of this school were achieving as compared to other private-school children....The first analysis consisted merely of a tabulation of the percentile ranks achieved by the various students among private-school students across the country for each of the five grade-groups as they existed that year. It was disturbing at first to discover that nearly all members of the first grade were in the bottom tenth, all members of the second grade in the bottom quarter, and that nearly all members of the third grade were in the bottom half of the population of private-school children tested with the Metropolitan Achievement Test. Such findings were disturbing to the parents of children in the lower grades even though the fourth graders ranged over the upper two-thirds, and all the fifth graders who had attended the school continuously from nursery school were in the upper third of fifth grade children tested on the Metropolitan Achievement Test.
>
> "It was only after a second analysis of the percentile ranks obtained by the then current fifth graders during their previous grades that the implications for this mode of teaching began to be evident. The percentile ranks that these

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* J. McV. Hunt, op. cit.

> fifth graders had obtained when they were in fourth, third, second, and first grades showed the same trend as did that of the various current grade-groups. Thus, it appeared that while such teaching might look ineffective at the lower grades by the criterion of performance on the Metropolitan Achievement Test, from the standpoint of final outcome at the fifth grade, it looked highly effective. Obviously, it is here impossible to separate the effects of the nursery-school experience from the techniques of teaching used in the grades, but the fact that those children who had not attended this school continually from nursery school did less well than those who had attended the school continuously indicates that the early experience was probably a factor." (pp. 275-277)

If consensus problems are difficult in the case of mathematics or reading comprehension, they may be staggering in the case of history, "social studies," and "international affairs." For in those areas -- and, in a somewhat different sense, in the areas of biology and physics -- there are not only problems of sequence and approach, but also problems of the quantity and quality of content. (Indeed, so far as sequence and approach are concerned in any area, it is an implication of the notion discussed above of "matching treatments to needs" that different kinds of students at the same chronological age might be mastering very different aspects of any subject matter, even if all treatments were designed to bring nearly everyone to the same level of competence at some end point -- say, high school graduation.[27]

When one turns to the "other" dimensions along which it might be considered the function of schools to help children grow, the problems become still more complicated.

For one thing, it may often be the case that the most important function a school can perform for a child is to add to one or more of the "characteristics" that, in other children, are already facilitating their mastery of subject matter. That is, it may be that the transformation of self-doubt into autonomy, or the provision of Piaget's or Hunt's "concrete schemata"* needs to take priority over subject matter learning during several years time; _in order to_ optimize later cognitive growth.

For another thing, growth along such dimensions as "citizenship," "respect for the law-without-idolatry-of it," "empathy," and the like obviously pose measurement problems of a very severe order.

None of these problems, however, is in priciple insuperable. Perhaps the most important point to bear in mind in attacking them is that it is _growth_ that is the major dependent variable, not point-in-time scores; and that there are probably many different paths to some common end point. If students of Type X, then, are found to diverge further and further from students of Type Y during their first through sixth or even ninth grades, there may be no inferences possible concerning the relative effectiveness of the two different educational treatment they may be receiving. As in the case of marriages, it is not how they begin but how they end that is the measure of their success.

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* Hunt, _op. cit._, discusses these concepts of Piaget.

Moreover, to engage in the kind of research advocated above would necessarily involve measuring students' growth along all dimensions -- from Erikson's personality dimensions through Hunt's cognitive ones to subject matter mastery. Students whose growth on one seemed to be occurring at the expense of growth on another would be detected at each testing point; and the question of whether this was a functional or a dysfunctional "detour" could be answered by comparative analysis at subsequent testing points.

So far as the dimensions of "citizenship" or "empathy" are concerned, our metrics leave much to be desired; but it is not at all likely that teachers' and peers' ratings and more "unobtrusive measures"/28 would be so clumsy as to be valueless.

In any case, the major implication of such studies as Coleman's and Project TALENT's is that they make us sharply aware of the issues that need research before the kind of data they present can be adequately interpreted.

HEALTHY LEAVES AND STUDENT ACHIEVEMENT

An assumption (but not a necessary one) of some of the foregoing analysis has been that all students have the same potential ability to understand such things as arithmetic, literature, and social studies, and to develop initiative, autonomy, and so on, to the same degree. The assumption was conveyed in analogizing such "growth" to plants' development of "healthy" leaves. But the assumption may obviously be incorrect. Perhaps the better analogy is to compare different students' potentialities for growth along any of those dimensions -- especially the cognitive ones -- with different plants' potentialities for developing roses or lilacs.

Perhaps, in other words, it is at best a Procrustrean enterprise to attempt to find those educational treatments with which student characteristics can be matched in such a way as to produce the same degree of mathematics understanding in everyone by late adolescence. Although there is no evidence to demonstrate conclusively that some students -- or perhaps even some racial, ethnic, or sexual categories of students -- have genetic characteristics that _no_ environmental treatments can turn into mathematical sophistication, there is, on the other hand, no evidence to demonstrate conclusively the opposite.

Until the unlikely day that there will be such evidence, one way or the other, efforts to improve the quality of education will have to guard against two opposite dangers.

The danger of proceeding as if there are treatments that, if only they can be found, can turn students with any characteristic into competent mathematicians, for example, when in fact that is not so, is that both students and educators will needlessly be frustrated. The danger of proceeding as if that were not the case, when in fact it is, is that students can be doomed to non-learning as the outcome of a self-fulfilling prophecy; and educators can be doomed to complacent ritualism.

Moreover, even apart from the possibility of genetic limitations, there are limitations on all students performing equally well on all tests, imposed by differences in allocations of time. Dedicated young musicians or dancers, for example, are hardly as likely to score as well on mathematics tests as dedicated young engineers, regardless of genes or treatments; any more than all students are going to run a four minute mile, regardless of any kind of coaching.

In measuring the effectiveness of schools, then, it is going to be necessary to take into account a great variety of dimensions along which students can grow.

There is a distinct sense in which a school whose students' average growth along any one or all dimensions is less than that of another school may still be performing an educational function more effectively. This is the sense that various sub-groups of its student body may each be growing optimumly along different ones of the measured dimensions. If, to take an arbitrary example, one-tenth of School A's students were growing excellently on dimension 1, another tenth were growing excellently on dimension 2, and so on, whereas School B's students were all growing minimally on all ten dimensions, it is possible that the average score of School A's students on each of the ten dimensions would be less than that of School B's students. This, of course, would reveal something important about the two schools, but what it revealed would be apparent only if the information on which the schools were evaluated included comparisons between the fastest-growing segments of the two schools on each dimension. A mere comparison of all-school averages would be seriously misleading.

It should be part of research policy, for this reason, to compare schools and school treatments not only with respect to their students' average growth on many different dimensions, but also with respect to the growth experienced by, say, the various thirds, quintiles,or deciles of growth-scorers in each school on each dimension. Only in this way will we be able to recognize that different schools may be performing effectively different kinds of educational functions for different kinds of students.

SUMMARY

The differential achievement of secondary school students on tests of literature information, social science, and mathematics appears to be related very little to any measured characteristics of the schools they attend. There is some evidence that achievement is related to family backgrounds; but in the first place those relationships are not high, and in the second place neither family backgrounds nor school characteristics, nor students' personality structures are related to the growth of students in achievement between their ninth and twelfth grades. Moreover, when schools are classified according to the degree of their possession of characteristics thought a-priori to represent high quality education, there is no difference between schools in their ability to affect the relationship between predisposing characteristics of students on the one hand and the cognitive growth of those students on the other.

It cannot, however, be inferred from those findings that school factors make no difference for achievement or for growth. The absence of a correlation between any gross characteristic of a school and the average scores of its students could result from several circumstances other than the circumstances that the characteristic in question is ineffective. What matters is the concrete matching within schools of student needs on the one hand and pedagogical treatments on the other.

Until research is carried out on the differential responses of different kinds of students to different kinds of teacher-student transactions, interpretations of the results of such studies as those of Coleman and Project TALENT is very difficult. Such clarifying research must also be carried out in such a way as to insure recognition of school variability in producing student growth along many different cognitive as well as other dimensions.

HCB/bms
5/25/67

FOOTNOTES

1. Erving Goffman, *Encounters* (Indianapolis: Bobbs-Merrill Co., 1961)

2. Henry A. Murray, *Explorations in Personality* (New York: Science Editors, Inc., 1962).

3. Richard A. Cloward and L. E. Ohlin, *Delinquency and Opportunity* (New York: Free Press of Glencoe, 1960).

4. The sources of the data to be reviewed are two: John C. Flanagan, *et al*, *The American High School Student* (University of Pittsburgh: Final Report for Cooperative Research Project No. 635, U.S. Office of Education, Department of Health, Education and Welfare, 1964); and a computer print-out of correlations, labelled "Matrix I-A," kindly loaned by the Project TALENT Data Bank to the writer.

5. James S. Coleman, *et al*, *Equality of Educational Opportunity* (Washington, D.C.: U.S. Government Printing Office, 1966).

6. This analysis was carried out by the staff of the Project TALENT Data Bank, University of Pittsburgh, according to the writer's instructions, under grant No. OEG-1-7-068570-0192 from the U.S. Office of Education, Department of Health, Education, and Welfare.

7. These are, more accurately, schools in areas in which principals estimated that most of the housing was low or middle income housing, and most of the families were low or middle income families.

8. The six background factors controlled are described below.

9. Matrix I-A.

10. The zero-order correlation of these attitudes with achievement were between .4 and .5. (Coleman, p. 319)

11. Namely: (1) Urbanism of community in which student and mother grew up and migration history; (2) parents' education; (3) structural integrity of the home (presence of mother and father); (4) smallness of family; (5) items in home -- TV, telephone, record player, refrigerator, automobile, vacuum cleaner; (6) reading material in home -- dictionary, encyclopedia, daily newspaper, magazines, books.

12. Namely: (1) An index of "parental interest" based on answers to questions as to whether they talked to their parents about school and whether anyone read to them when they were small; and (2) an index of parents' educational desires based on answers to questions as to how good a student the parents want the child to be; how far in school they want him to go; and their attendance at P.T.A. All information is as reported by students.

13. Coleman, Tables 3.221.1 and 3.221.2, p. 299.

14. This study was, in fact, begun before the Coleman report was published; but the reasoning behind it was essentially that stated in the text.

15. These characteristics were obtained from responses to a questionnaire completed by high school principals in 1960. They are, then, teacher characteristics as of the beginning of the "growth period" analyzed here. This is the case with respect to all of the independent variables discussed in this section.

16. Arthur Stinchcombe, Rebellion in a High School (Chicago, Ill.: Quadrangle Books, 1964).

17. Goffman, op. cit.

18. Erik Erikson, "Identity and the Life Cycle," in George S. Klein, ed., Psychological Issues (New York: International University Press, Inc., 1959).

19. On the further assumption that each station received about the same mixture of plants to cultivate.

20. The remaining four cells of the table -- 2, 4, 9, and 12 -- are labelled "not applicable." They are not applicable in the sense that the combination of student and treatment conditions generating them are logically contradictory. Cell 2, for example, says that all students are alike but they receive different treatments depending on which school they attend and those differences are appropriately matched, which is a contradiction in terms.

21. See J. McV. Hunt, Intelligence and Experience (New York: The Ronald Press Co., 1961); Richard M. Wolf, "The Identification and Measurement of Environmental Process Variables Related to Intelligence," unpublished Ph.D. dissertation, University of Chicago, 1964; and Erik Erikson, op. cit.

22. cf. Hunt, ibid.

23. Erik Erikson, op. cit.

24. Henry Murray, op. cit.

25. Talcott Parsons, et al, *Family, Socialization, and Interaction Process* (New York: Free Press of Glencoe, 1955).

26. Jerome Bruner, *Toward a Theory of Instruction* (Cambridge, Mass.: Harvard University, 1966)

27. This is another way in which, even if all schools were performing with superlative efficiency, one might find large variance within and/or between school if one gave everyone the same standard test at each grade.

28. Eugene Webb, et al, *Unobtrusive Measures* (Chicago: Rand McNally & Co., 1966).